

What is claimed is:

1. A system for providing a timing reference on which data transmission between a network hub and a user terminal in a satellite-based communications network are based, said  
5 system comprising:

an outroute hub, adapted to transmit a timing signal to a satellite in said network for receipt by said network hub and said user terminal; and

10 a data transmission timing apparatus, disposed at said network hub and adapted to establish, based on said timing signal, said timing reference on which data transmission from said user terminal to said network hub is based.

2. A system as claimed in claim 1, wherein said outroute hub comprises:

a data frame transmitter, adapted to transmit a stream of data frames as said timing signal.

15

3. A system as claimed in claim 2, wherein:

said data frame transmitter transmits said stream of data frames as Reed-Solomon frames.

20

4. A system as claimed in claim 2, wherein:

said data frame transmitter is adapted to group respective pluralities of said data frames into respective groups of data frames.

25 5. A system as claimed in claim 2, wherein:

said data frame transmitter assigns numbers to said data frames.

6. A system as claimed in claim 5, wherein:

said data transmission timing apparatus establishes said timing reference based on said numbers assigned to said data frames.

30

7. A system as claimed in claim 5, wherein:  
said data frame transmitter includes in said data frame stream at least one frame numbering data packet on which numbering of said data frames is based.
- 5 8. A system as claimed in claim 1, wherein:  
said data transmission timing apparatus is adapted to determine, based on said timing reference, time instants at which data frames transmitted from said user terminal are to arrive at said network hub.
- 10 9. A method for providing a timing reference on which data transmission between a network hub and a user terminal in a satellite-based communications network are based, said method comprising the steps of:  
transmitting a timing signal from a location other than said network hub to a satellite in said network for receipt by said network hub and said user terminal; and  
15 establishing at said network hub, based on said timing signal, said timing reference on which data transmission from said user terminal to said network hub is based.
10. A method as claimed in claim 9, wherein:  
said transmitting step transmits a stream of data frames as said timing signal.
- 20 11. A method as claimed in claim 10, wherein:  
said transmitting step transmits said stream of data frames as Reed-Solomon frames.
12. A method as claimed in claim 10, wherein said transmitting step comprises the  
25 step of:  
grouping respective pluralities of said data frames into respective groups of data frames.
- 30 13. A method as claimed in claim 10, wherein said transmitting step comprises the  
step of:

assigning numbers to said data frames.

14. A method as claimed in claim 13, wherein:

said establishing step establishes said timing reference based on said numbers assigned  
5 to said data frames.

15. A method as claimed in claim 13, wherein said transmitting step comprises the  
step of:

including in said data frame stream at least one frame numbering data packet on which  
10 numbering of said data frames is based.

16. A method as claimed in claim 9, wherein said establishing step includes the step  
of:

determining, based on said timing reference, time instants at which data frames  
15 transmitted from said user terminal are to arrive at said network hub.

17. A method as claimed in claim 9, further comprising the step of:

controlling said user terminal to transmit data to said network hub in accordance with  
said timing reference.

20

18. An apparatus, adapted for use with a satellite-based communications network  
comprising at least one satellite, at least one network hub and a plurality of user terminals, for  
providing a timing reference on which data transmissions between said at least one network  
hub and said plurality of user terminals are based, said apparatus comprising:

25 a transmitter, adapted to transmit an uplink signal to a satellite in said network for  
receipt by said at least one network hub, said plurality of user terminals and said apparatus;

a receiver, adapted to receive an echo signal based on said uplink signal transmitted to  
said satellite; and

30 a timing device, adapted to establish said timing reference based on a time at which said  
receiver receives said echo signal in relation to a time at which said transmitter transmitted said

uplink signal.

19. An apparatus as claimed in claim 18, wherein:

said timing device is adapted to generate a stream of data frames as said timing  
5 reference.

20. An apparatus as claimed in claim 19, wherein:

said timing device generates said stream of data frames as Reed-Solomon frames.

10 21. A method, for use with a satellite-based communications network comprising at least one satellite, at least one network hub and a plurality of user terminals, for providing a timing reference on which data transmissions between said at least one network hub and said plurality of user terminals are based, said method comprising the steps of:

transmitting, from an apparatus other than said network hub, an uplink signal to a  
15 satellite in said network for receipt by said at least one network hub, said plurality of user terminals and said apparatus;

receiving at said apparatus an echo signal based on said uplink signal transmitted to said satellite; and

20 establishing said timing reference based on a time at which said apparatus receives said echo signal in relation to a time at which said apparatus transmitted said uplink signal.

22. A method as claimed in claim 21, wherein said establishing step includes the step of:

generating a stream of data frames as said timing reference.

25

23. A method as claimed in claim 21, wherein said establishing step includes the step of:

generating a stream of Reed-Solomon frames as said timing reference.